Delivering Structured Educational Images over a Network

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INTRODUCTION

Beyond viewing images and text, medical students need to see what structures are identifiable within the images. *Overlays,* consisting of a *region* of the image plus associated text, are crucial to learning. We call the image plus its overlays a *slide.*

CURRENT STRATEGIES

To be functionally useful, an slide database must provide: (1) images; (2) overlays; (3) testing; (4) searching; (5) slide comparisons. To be usable as a computer system, it must be (1) fast, (2) inexpensive, (3) networkable.

Currently available tools make delivery of slides difficult. Stand-alone programs do not scale up to networks. The Internet-based World-Wide Web cannot easily display overlays or give region-based feedback. Flat-file databases cannot deliver overlays. Relational databases, can satisfy all the specifications. but only problematically. First, the storage of the images and overlays in tables leads to slow response time, because the server must perform one or more joins of the tables to yield up a slide. Second, transmission of the data from server to client may be bogged down in middleware. Third, the client must reconstruct the slide from the content delivered.

Object-oriented databases (OODBs), on the other hand, can store an entire slide as a single object, and can deliver that object directly to the client; no joins or reconstructions are necessary. However, OODBs tend to be expensive.

OVERLAYER

We have constructed an object-oriented application for viewing slides. The slide can be stored as a file in a system directory, or it can be stored in an OODB.

OverLayer is a Macintosh 680x0/PowerPC-native PICT image browser application that has the ability to view predefined QuickDraw regions of discontiguous areas or points within an image. Overlays may contain a text-string name and a verbose short paragraph descriptionr. An overlay may be located by clicking on it directly or by selecting its name from a scrolling list.

In addition to viewing PICT images and layers, OverLayer contains a testing mode for identifying and/or locating a randomly selected layer within a randomly selected slide.

USING OVERLAYER

We have created a 250-slide image database for our Histology course. The Histology Imagebase has replaced the slide carousels used by faculty members to preview—and by students to review—the course teaching slides. The images are 24-bit, 640 x 480 pixel digitized photomicrographs. Regions were created by a medical student using a number of off-the-shelf tools, and content was edited by a faculty member. The slides reside in files organized into directories by organ system. The Imagebase is extended by placing a file in the appropriate organ-system folder; OverLayer updates its holdings when it is opened.

The only functionality not supported by the file-system-based storage of slides is text searching.

PLANS

Our goals are to make OverLayer a World-Wide Web helper application, so the Web can in fact be used to provide the distributed teaching environment students want, and to create an OverLayer Editor, so content experts can create slides on their own. We also plan to expand the content areas beyond histology. By loading OverLayer on computers available throughout campus and at home, students will have access to a true just-in-term learning resource.

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